pre-Cretaceous surface. Nearshore marine and continental-fluviomarine sandstone bodies of Late Cretaceous age yield nonassociated natural gas in western Saskatchewan; the best prospects appear to be at the base of this sequence in southwestern Saskatchewan.

CLIFTON, H. E., R. E. HUNTER, and R. L. PHILLIPS, U. S. Geol. Survey, Menlo Park, Calif.

Depositional Models from a High-Energy Coast

The 2 most common depositional systems along the coast of southern Oregon are the nonbarred nearshore and the longshore bar–rip channel systems. Detailed observation of these systems, largely by scuba diving, has led to delineation of facies of sedimentary structures and recognition of their genetic relation to physical processes operating in the high-energy coastal environment. A 3-dimensional analysis of the geometric interrelation of the facies within each system permits construction of progradational depositional models that can be used to identify deposits of similar origin in the stratigraphic record.

In the most simple depositional system, the nonbarred nearshore, the bottom profile extends smoothly seaward into deeper water. Progradation of the facies in this system will produce a distinctive vertical sequence. At the base lies fine sand of the offshore facies, which shows landward-dipping ripple lamination and scour-and-fill structure. The upper part of this facies is likely to contain lenses of crossbedded coarser sand in which foresets dip landward. The facies grades upward into predominantly cross-stratified beds formed by different facies of the surf zone. The upper crossbeds are likely to be gravelly and inclined seaward. They are overlain by planar-bedded swash facies.

Progradation of the longshore bar–rip channel system produces a different sequence. An erosion surface separates the offshore facies from overlying rip channel facies in which crossbedding dips seaward. Above the rip channel facies lies a gradational sequence of longshore trough facies, wave-current complex facies, and, at the top, swash facies. In an actual situation, the bar facies, in which cross-stratification dips onshore, may be preserved locally within the deposit.

CLIFTON, H. E., U. S. Geol. Survey, Menlo Park, Calif.

Miocene Marine to Nonmarine Transition in Southern Coast Ranges of California

The southeastern Caliente Range, in the southern Coast Ranges of California, contains a remarkably exposed transition between marine and nonmarine rocks. The transitional sequence consists of depositional facies that contain sedimentary structures comparable to those found at present in coastal environments in Oregon and California. The spatial relations of the facies are consistent with their origin as interpreted from depositional structures. Directional structures and lateral trends within the deposit relate to the local middle Miocene paleogeography as deduced from independent evidence.

Fine-grained ripple-bedded and bioturbated shelf sediment constitutes the seaward-most facies. Medium- to coarse-grained sandstone in which crossbedding dips predominantly seaward defines a facies that resembles deposits produced by laterally migrating longshore bar-rip channel systems. Abundant medium-scale (5–30 cm) trough cross-stratification characterizes a facies similar to that formed in the modern high-energy surf zone. Planar sand and gravel layers that dip gently seaward identify another facies, one with a modern counterpart on the lower foreshore. Heavy-mineral layers 1–10 cm thick that dip gently seaward, where they interfinger with quartzose sand, identify ancient upper foreshore deposits. Other facies include oyster-bearing siltstone (probably a lagoonal deposit) and structureless muddy medium-grained sandstone that may represent a vegetated back-beach deposit. Structureless red mudstone, sandstone, and conglomerate of alluvial origin form the most landward facies.

The different facies are repeated cyclically throughout the transitional sequence. Within each cycle the facies lie in an ascending order of increasingly shallow-water deposition. Each cycle represents a progradational episode; the intervening transgressions are indicated by erosional surfaces, in places covered by a thin layer of conglomerate. This cyclic repetition of slow progradation interrupted by rapid submergence may relate to episodic movements on the nearby San Andreas fault.

CONOLLY, J. R., and W. H. KANES, Univ. South Carolina, Columbia, S.C.

Jurassic Limestone Facies of Atlas Mountains and Comparison with its Recent Red Sea Model

The Atlas Mountains of Morocco stretch across the northwest African continent and can be subdivided into the High Atlas on the south and the Middle Atlas on the north, separated by the broad Atlas platform in eastern Morocco. The Lower and Middle Jurassic rocks which form the Atlas Mountains consist of a series of limestones, interbedded dolomites, and cherts. These rocks comprise the following three facies: (1) littoral-lagoon facies; (2) shelf facies characterized by reefs and a shallow-water neritic fauna; and (3) a deeper-water bathyal facies dominated by planktonic forams and radiolarians. The facies of the Middle Atlas are similar to those of the High Atlas and were deposited in a branch of the Atlas sea. Detailed studies of the High Atlas indicate that it grew in response to rifting. Both north and south margins are characterized by reefs and shaly limestone, which were deposited over steep fault scarps. The Atlas ocean, which formed during the Early Jurassic and reached its demise during the Late Jurassic can be compared favorably with the Red Sea from the point of view of facies distribution, faunal associations, and gross size and geographic relations.

COOK, H. E., Univ. California, Riverside, Calif.

North American Stratigraphic Principles as Applied to Deep-Sea Sediments

North American stratigraphic principles as developed by geologists mapping on continents can be applied to deep-sea sediments. The ability of the Deep Sea Drilling Project to obtain long cored intervals over extensive areas of ocean basins makes possible the establishment and lithologic correlation of rock-stratigraphic units (*e.g.*, formations).

Deep-sea sediments should be divided and reported in terms of lithologic units which may be assigned rock-stratigraphic names if these units can be recognized at other sites. This practice is desirable in place of current stratigraphic practices in oceanography of defining rock-stratigraphic intervals by time-stratigraphic terms. The generally accepted North American usage of formation as a lithologic mappable unit devoid of any time connotation is recommended over the